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Published in:
Quality of Life Research

Quality of Life Research **9**: 439–450, 2000.

Functional decline after congestive heart failure and acute myocardial infarction and the impact of psychological attributes. A prospective study

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Accepted in revised form 24 May 2000

Abstract

This article examines the influence of three pre-morbidly assessed psychological attributes (i.e. neuroticism, mastery and self-efficacy expectancies) on functional decline after congestive heart failure (CHF; n = 134) and acute myocardial infarction (AMI; n = 79) in late middle-aged and older persons. Due to the prospective design of the study initial baseline levels of functional disability and number of chronic medical conditions could be adjusted, next to age, gender and the severity of either CHF or AMI. Functional disability was re-assessed 8 weeks after the diagnosis of either CHF or AMI. Significant unique contributions of self-efficacy expectancies were found for functional decline after CHF, while mastery significantly contributes to functional decline after AMI: those patients with higher levels of mastery or self-efficacy expectancies showed less decline. In conclusion, pre-morbidly assessed psychological attributes substantially influence functional decline after cardiac disease in late middle-aged and older persons, but the impact of specific attributes is somewhat different for CHF and AMI.

Key words: Acute myocardial infarction, Congestive heart failure, Functional decline, Mastery, Neuroticism, Self-efficacy expectancies

Introduction

Cardiac disease is prevalent among middle-aged and older persons and is considered a major cause of limitations in daily activities [1–7]. Stewart et al. [6] for example, showed that among adults levels of physical, social and role functioning were particularly affected by both congestive heart failure (CHF) and acute myocardial infarction (AMI). Patients with either CHF or AMI had much lower levels of functioning compared to patients with arthritis, chronic lung problems, gastro-intestinal disorders, back problems, angina or diabetes mellitus. Haan et al. [8] found that increased hospital utilization by elderly people in the 1970s and 1980s was most striking for patients with the diagnosis of CHF. Wolinsky et al. [9] recently reported that hospitalisation of older adults for CHF is a common, costly event with a poor prognosis. They found that more than 15% of a large representative sample of older adults had been hospitalized for CHF over an 8-year period. Although knowledge about the impact of CHF or AMI on daily life and health care use is growing, little is known about the factors which influence adaptive responses after the occurrence of these cardiac conditions. Sullivan et al. [10] for example, found only a weak relationship between standard clinical indices of cardiac disease severity and self-reported daily functioning in patients with cardiac disease. They suggested including psychosocial determinants as additional explaining factors of

functioning in future research among patients with cardiac disease. In the present prospective study, we focus on the impact of three psychological attributes on functional decline after CHF and AMI in late middle-aged and older persons. These attributes are: emotional stability, or low neuroticism; mastery, or perceived control; and general self-efficacy expectancies.

Theoretical considerations

Psychological attributes such as mastery, self-efficacy expectancies and neuroticism may help patients regain physical functioning after cardiac disease through a variety of behavioral and cognitive mechanisms (arrow A in Figure 1). One of these mechanisms pertains to rehabilitation compliance and health behavior. Self-efficacy expectancies and mastery are assumed to be related to adherence to health recommendations and different domains of health behavior [11–15]. Another mechanism through which psychological attributes such as neuroticism, mastery and self-efficacy expectancies may affect functional decline after cardiac disease relates to the process of coping [16]. Scheier et al. [17] for example, found that psychological attributes (e.g. dispositional optimism) were associated with coping efforts after coronary artery bypass surgery and affected physical recovery. Cardiac events such as CHF or AMI can be considered major occurrences which require adaptation and as such constitute adaptive challenges (arrow B in Figure 1). Cardiac diseases and associated functional decline increase the risk of distress (e.g. demoralisation) which, in turn, may result in further functional decline [18–20]. We assume that CHF and AMI patients with high pre-morbid levels of psychological attributes are able to break the downward spiral of functional disability and demoralisation after their cardiac event. We hypothesise that these attributes help patients to maintain or regain relatively high levels of functional ability despite their medical problems (arrow A in Figure 1).

To date, most studies on the impact of cardiac disease on functioning were cross-sectional and included mainly prevalent cases which resulted in heterogeneous samples in terms of disease phase. In our prospective study we included only patients with a new incident episode of either CHF or AMI. Pre-morbid (baseline) levels of functional disability were compared with 8-week post-morbid levels of functional disability, and the influence of the three selected pre-morbidly assessed psychological attributes on changes in functional disability after either CHF or AMI were analysed. Because the impact of cardiac disease on functional disability may be stronger in older patients and those who already have a chronic condition, we adjusted for initial, baseline levels of chronic medical conditions and age (arrows C in Figure 1). In addition, we adjusted for the severity of the

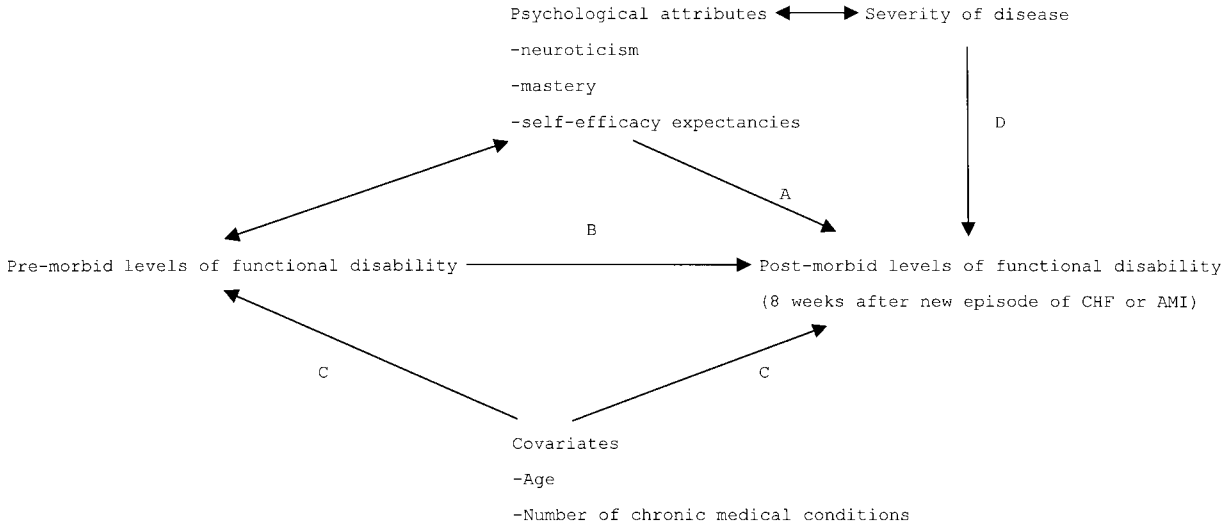

Figure 1. Research model.

cardiac event (arrow D) and for pre-morbid levels of functional disability (arrow B). We expected that patients with low pre-morbid levels of neuroticism and high pre-morbid levels of mastery or self-efficacy expectancies would show lower levels of functional decline after the event than their counterparts (arrow A in Figure 1).

Methods

The Groningen Longitudinal Aging Study (GLAS) is a population-based prospective follow-up study of the determinants of functional disability, well-being and utilization of care [2–4, 21]. The primary objective of GLAS is to identify the psychological and social factors that influence the trajectories of functional disability and well-being, independently of or in interplay with disease-related factors.

Baseline participants

The source population consisted of late-middle-aged and older persons, living independently or in adapted housing for elderly people in the north of the Netherlands. The study population comprised 8723 persons aged 57 and older on 1 January 1993, all patients on the list of family physicians participating in the Morbidity Registration Network Groningen (RNG). The RNG consists of 17 family physicians who register every doctor–patient encounter in a computerised health information system and 10 physicians who register the events of CHF and AMI on paper forms. In the Netherlands, approximately 99% of non-institutionalized older adults are registered with a family physician. By letter, physicians asked potential participants for permission to provide the GLAS research team with their names and addresses. A total of 1937 refused (22%). Of the remaining 6786, 1277 declined participation when contacted by the research team and 152 had died or left the practice by the time contact was initiated. Another 78 participants were excluded because of severe cognitive impairments at baseline (Mini-Mental State Examination Score of 16 or lower) [22]. Useful baseline data were available for 5279 research participants (62%; 5279/(8723 – 152)). The GLAS baseline assessment was carried out in 1993 and consisted of an interview and a mailed questionnaire. Research participants were interviewed face-to-face in their homes (n = 4792) or by telephone (n = 487) by well-trained middle-aged women; 4875 research participants gave written informed consent for follow-up research. The interviewers did not know the interviewees in either a clinical or an administrative aspect. The representativeness of the GLAS baseline sample has been described elsewhere [2].

CHF- and AMI incident patients

Patients who had a (new) incident of CHF- and AMI after the baseline assessment were recruited through the 27 family physicians participating in the Morbidity Registration Network Groningen (see above). Each fortnight, from the baseline wave in 1993 until 1 December 1996, these physicians passed on the names of all patients with a new episode of either CHF or AMI according to the criteria of the International Classification of Primary Care (ICPC) [23]. CHF was diagnosed if three of the following five symptoms were present: (a) dependent oedema, (b) raised jugular venous pressure or hepatomegaly in the absence of liver disease, (c) signs of pulmonary congestion or pleural effusion, (d) enlarged heart, and (e) dyspnoea in the absence of pulmonary disease (code K77 of the ICPC). During the enrolment period, 203 patients with a new episode of CHF after the baseline wave were recruited. A total of 69 patients (34%) did not participate in the follow-up interview (8 weeks after diagnosis), mainly due to mortality (n = 21), participation in one of the other GLAS cohort studies (on either cancer, hip fracture, stroke, AMI, depression or loss or disease of spouse; n = 20), very poor physical and/or mental health (n = 14) or refusal to participate (n = 7). Seven patients diagnosed with CHF were excluded because they were already included in the study as AMI patients. Fifty-five of the 134 participating CHF patients (41%) reported (unspecified) heart problems at baseline.

AMI was diagnosed if two of the following three symptoms were present: (a) chest pain characteristic of myocardial ischemia, lasting more than 15 min, (b) abnormal ST-T changes or Q waves in electrocardiogram or (c) elevation of blood cardiac enzymes (code K75 of the ICPC). During the

enrolment period, 154 patients with AMI were recruited. Seventy-five patients (49%) did not participate in the follow-up interview mainly due to mortality (n = 42), participation in one of the other GLAS cohort studies (n = 11), inability to interview the patient within a 10-week follow-up interval (n = 10) or refusal to participate (n = 4). Five patients diagnosed with AMI were excluded because they were already included in the study as CHF patients. Twenty-four of the 79 participating AMI patients (30%) reported (unspecified) heart problems at baseline.

During the enrolment period between 1993 and 1997, 5 patients who were diagnosed with both AMI and CHF did not participate in the study. Participating patients were again interviewed face-to-face in their homes by well-trained middle-aged women 8 weeks after the diagnosis of the new episode of either CHF or AMI.

Dependent measure

Functional disability at baseline and at follow-up was assessed with the Groningen Activity Restriction Scale (GARS; see appendix) [24]. GARS comprises 18 ADL/IADL items, each with four response categories. Scores may range from 18 (no functional disability) to 72 (maximum functional disability). The results of previous studies showed that GARS meets the stochastic cumulative scalability criteria of the Mokken Model [24, 25]. The internal reliability estimate of the GARS at baseline was 0.91. Changes in functional disability were expressed as individual differences between the 1993 baseline scores and the 8-week post-morbid scores (the pre-morbid baseline GARS scores were subtracted from the post-morbid GARS scores).

Independent measures

The three psychological attributes were measured at baseline in 1993: mastery or perceived control (7 items, a scale developed by Pearlin) [26], general self-efficacy expectancies (16 items, a scale developed by Sherer and adapted by Bosscher) [27–29] and neuroticism (the 12 item Eysenck Personality Questionnaire, EPQ-R) [30, 31]. Mastery concerns the extent to which one regards ones life-changes as being under ones control in contrast to being ruled by fate. Self-efficacy expectancies refer to the belief that one can successfully perform intended behaviours. Neuroticism (or emotional instability) is related to a constant preoccupation with things that might go wrong, and a strong emotional reaction of anxiety to these thoughts (see Appendix for items). The selected psychological attributes are considered to be fairly stable over time, particularly in a reasonably short interval of a couple of years, although levels of mastery and self-efficacy expectancies may be susceptible to serious events or therapeutic interventions [27, 32–34]. Scores may range from 7 to 35 (mastery), from 16 to 80 (general self-efficacy expectancies) and from 0 to 12 (neuroticism) and represent the level of mastery, self-efficacy expectancies and neuroticism, respectively; cut-offs were not used for these concepts. The psychometric properties of the Dutch versions of the three scales have been assessed as satisfactory in previous (pilot) studies. The internal reliability estimates were 0.71 (mastery) [35], 0.87 (self-efficacy expectancies) [28] and 0.81 or above [31], respectively. Test–retest reliability correlations were available for mastery and neuroticism: 0.67 (mastery, 8 weeks) [35] and 0.78 (neuroticism, 12 months) [31]. The internal reliability estimates of the three scales at baseline in the present study were 0.79 (mastery), 0.84 (general self-efficacy expectancies) and 0.82 (neuroticism), respectively.

A checklist of 19 chronic medical conditions was administrated in the interview part of the baseline data collection. These conditions were: asthma or chronic bronchitis, pulmonary emphysema, heart condition, hypertension, (consequences of) stroke, leg ulcer, stomach ulcer, liver disorder or gallstones, kidney disease, prostate disease, diabetes mellitus, thyroid gland disorder, back problems for at least 3 months or slipped disc, joint conditions or arthritis, migraine or chronic headache, serious dermatological disorders like psoriasis and eczema, cancer, multiple sclerosis and Parkinson's disease or epilepsy. Baseline participants were asked whether they had had a specific chronic medical condition in the 12 months prior to the interview. To reduce potential reporting bias by patients, only conditions for which a family physician or medical specialist was consulted, or for which medication was used during the 12 months prior to the interview were included. The same procedure is used by the Dutch Central Office for Statistics in its periodic Health Survey Interviews

[36]. Results from two Dutch studies showed acceptable agreements between such self-ratings of chronic medical conditions and physician-registered conditions, except for arthritis [1, 37]. In this article, we used the number of chronic medical conditions as an index of chronic (co) morbidity.

Severity of either CHF or AMI at follow-up was assessed using the criteria of the New York Heart Association Classification (NYHA) [38]. A checklist was used to classify patients in a standardised manner for dyspnoea or fatigue at different levels of physical activity. Four classes were distinguished. (I) Patients with cardiac disease without limitations in physical activity. Ordinary physical activity did not cause undue dyspnoea or fatigue. (II) Patients with cardiac disease resulting in slight limitation of physical activity. Comfortable at rest. Ordinary physical activity resulted in dyspnoea or fatigue. (III) Patients with cardiac disease resulting in marked limitation of physical activity. Less than ordinary physical activity caused dyspnoea or fatigue. (IV) Patients with cardiac disease resulting in inability to carry on any physical activity without discomfort. Symptoms of dyspnoea may be present even at rest. If any physical activity is undertaken, discomfort increased.

Analysis

Bivariate associations between the dependent and the independent variables were analysed with Pearson correlation analyses. Significance of differences between correlations were tested with a method according to Lindeman et al. [39]. To study whether the psychological attributes affected functional decline after CHF or AMI, multiple regression analyses were conducted using the change score for functional disability as the outcome measure. One series of regression analyses comprised only one of the three selected psychological attributes, next to the covariates age and gender, baseline levels of functional disability, chronic medical conditions and severity of either CHF or AMI, whereas another series included all three selected psychological attributes simultaneously in the regression equation. The variance inflation factor (VIF) was used to measure collinearity in all regression models. A VIF of 10.0 or lower was considered acceptable [40]. All analyses were carried out with the Statistical Package for the Social Sciences (SPSS/PC+, Version 5.0.2.) [41].

Non-response analysis

As mentioned, 69 CHF- and 75 AMI-patients did not participate in the follow-up due to mortality, participation in other GLAS cohort studies, very poor physical and/or mental health or refusal. The non-response analysis consisted of a comparison of baseline results for neuroticism, mastery, self-efficacy expectancies, age, gender, chronic medical conditions and functional disability between participating patients, non-participating patients and the remaining GLAS baseline participants. Differences were tested with the Scheffé-test for multiple comparisons.

Results

The descriptive statistics of dependent and independent variables are shown in Table 1.

Table 2 shows the baseline scores for CHF- and AMI-patients who participated in the follow-up, patients who did not participate in the follow-up and the remaining baseline participants (i.e. non-patients). Participating and non-participating CHF-patients did not differ significantly on any of the selected variables at baseline before the episode emerged. At baseline, CHF-patients reported lower levels of mastery and self-efficacy expectancies, more chronic medical conditions and higher levels of functional disability than non-patients. Participating and non-participating AMI-patients did not differ significantly on neuroticism, mastery, self-efficacy expectancies, number of chronic medical conditions and functional disability at baseline before the episode emerged. However, the non-participating AMI-patients were significantly older than the participating patients and non-patients. Furthermore, AMI was less prevalent among females.

Table 3 shows the correlation matrix for the selected baseline measures for CHF- and AMI-patients. In CHF-patients, pre-morbid baseline levels of functional disability were significantly related to all other variables at baseline except neuroticism. In AMI-patients, only mastery and

Table 1. Characteristics at baseline and at follow-up of CHF and AMI study populations and the total baseline sample

	Theoretical range of scores	CHF (n = 134)		AMI (n = 79)		Total baseline sample (n = 5279)	
		Mean	SD	Mean	SD	Mean	SD
At baseline (pre-morbid)							
Neuroticism[a]	0–12	3.8	3.2	3.7	3.0	3.7	3.1
Mastery[a]	7–35	23.0[d]	5.2	24.5[d]	5.1	24.7	5.3
Self-efficacy expectancies[a]	16–80	57.1	11.8	59.7	10.0	60.0	11.4
Age		75.1[e]	7.2	68.7[e]	7.6	69.6	8.0
Age range		58–96 years		57–87 years		57–99 years	
Gender (% women)		53[j]		30[j]		56	
Chronic medical conditions[b]	0–19	1.9[f]	1.5	1.3[f]	1.2	1.2	1.2
Functional disability[c]	18–72	27.2[g]	10.1	22.1[g]	5.7	23.1	8.1
At follow-up (post-morbid)							
Functional disability[c]	18–72	31.8[h]	12.2	26.0[h]	7.9		
Severity of disease (NYHA)[c]	1–4	2.5[i]	1.0	2.0[i]	1.0		
Class							
I[1]		21.6[k]		45.6[k]			
II[1]		20.9		13.9			
III[1]		43.3		35.4			
IV[1]		14.2		5.1			

[a] Higher scores indicate higher levels of neuroticism, mastery, and self-efficacy expectancies.
[b] Number of chronic medical conditions.
[c] Higher scores indicate poorer function.
[d–i] *t*-test for independent samples, $p < 0.05$.
[j,k] χ^2, $p < 0.05$.
[l] % NYHA.

Table 2. Psychological attributes and other baseline characteristics of Chronic Heart Failure (CHF-) and Acute Myocardial Infarction (AMI-), according follow-up participation status

	CHF				Non-CHF		AMI				Non-AMI	
	Participants (n = 134)		Non-participants (n = 69)		Remaining Base-line participants (n = 5076)		Participants (n = 79)		Non-participants (n = 75)		Remaining Base-line Participants (n = 5125)	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Neuroticism[a]	3.8	3.2	4.0	3.2	3.7	3.1	3.7	3.0	3.4	3.0	3.7	3.1
Mastery[a]	23.0[d]	5.2	21.6[e]	5.2	24.8[d,e]	5.3	24.5	5.1	24.8	5.6	24.7	5.3
Self-efficacy expectancies[a]	57.1[d]	11.8	55.2[e]	10.9	60.2[d,e]	11.4	59.7	10.0	58.6	11.6	60.0	11.4
Age	75.1[d]	7.2	77.4[e]	6.6	69.3[d,e]	8.0	68.7[f]	7.6	72.1[f,g]	8.0	69.6[g]	8.0
Gender (% women)	53		46		56		30[h]		40[i]		57[h,i]	
Chronic medical conditions[b]	1.9[d]	1.5	1.7[e]	1.4	1.2[d,e]	1.2	1.3	1.2	1.5	1.3	1.2	1.2
Functional disability[c]	27.2[d]	10.1	29.6[e]	12.2	22.9[d,e]	7.9	22.1	5.7	24.2	8.1	23.1	8.2

[a] Higher scores indicate higher levels of neuroticism, mastery, and self-efficacy expectancies.
[b] Number of chronic medical conditions.
[c] Higher scores indicate poorer function.
[d–g] Scheffé-test for multiple comparisons, $p < 0.05$.
[h,i] χ^2, $p < 0.05$.

Table 3. Correlation matrix for psychological attributes and other baseline variables for CHF- and AMI-patients

Measure	Mastery[a]	Self-efficacy expectancies[a]	Age	Gender	Chronic medical conditions[c]	Functional disability[d]
CHF-patients						
Neuroticism[a]	−0.44[e]	−0.46[e]	0.03	0.09	0.09	0.16
Mastery[a]		0.58[e]	−0.27[e]	−0.19[e]	−0.13	−0.35[e]
Self-efficacy expectancies[a]			−0.07	−0.13	−0.01	−0.22[e]
Age				0.17	−0.10	0.27[e]
Gender[b]					0.10	0.28[e]
Chronic medical conditions[c]						0.28[e]
AMI-patients						
Neuroticism[a]	−0.27[e]	−0.24[e]	−0.30[e]	−0.07	0.10	−0.03
Mastery[a]		0.36[e]	−0.14	−0.11	−0.16	−0.46[e]
Self-efficacy expectancies[a]			−0.28[e]	−0.26[e]	−0.17	−0.21
Age				0.31[e]	0.03	0.17
Gender[b]					0.22	0.38[e]
Chronic medical conditions[c]						0.13

[a] Higher scores indicate higher levels of neuroticism, mastery, and self-efficacy expectancies.
[b] 1 = male, 2 = female.
[c] Number of chronic medical conditions.
[d] Higher scores indicate poorer function.
[e] $p < 0.05$.

gender were significantly related to baseline levels of functional disability.

Table 1 already showed that pre-morbid levels of functional disability were higher in CHF-patients than in AMI-patients (27.2 vs. 22.1). The magnitude of functional decline between baseline and follow-up was also greater for CHF-patients (4.9 on the GARS; $p < 0.05$) than AMI-patients (3.9 on the GARS; $p < 0.05$); however, the difference in the decline between the two patient groups was not significant ($t = 1.01$, $p = 0.314$). The correlation coefficients between baseline and follow-up levels of functional disability (not in the table) were 0.80 (for CHF) and 0.54 (for AMI), respectively.

The bivariate correlation coefficients between the three psychological attributes at baseline and severity of disease at follow-up and functional decline for CHF- and AMI-patients between baseline and follow-up are presented in Table 4. All selected psychological attributes were related to disease severity in CHF-patients. The results furthermore indicate that CHF-patients with higher levels of self-efficacy expectancies at baseline showed less functional decline after their event while among AMI-patients, higher levels of mastery at baseline were significantly associated with less functional decline after AMI. However, these latter correlations between CHF- and AMI-patients did not differ significantly for both mastery and self-efficacy expectancies.

Table 4. Correlations between severity of disease, increase in functional disability and neuroticism, mastery and self-efficacy expectancies for CHF-patients and for AMI-patients

	Severity of disease		Increase in functional disability	
	CHF	AMI	CHF	AMI
Neuroticism[a]	0.36[b]	0.08	0.12	0.03
Mastery[a]	−0.18[b]	−0.10	−0.14	−0.25[b]
Self-efficacy expectancies[a]	−0.28[b]	0.03	−0.30[b]	−0.22

[a] Higher scores indicate higher levels of neuroticism, mastery, and self-efficacy expectancies.
[b] $p < 0.05$.

Table 5 presents the outcomes of multiple regression analyses for CHF-patients and

Table 5. Multiple regression analysis of the association between psychological attributes and other baseline characteristics and severity of disease at follow-up with functional disability for CHF- and AMI-patients

Measure	Increase in functional disability							
	CHF				AMI			
	Step 1	Step 2	Step 3	Step 4	Step 1	Step 2	Step 3	Step 4
At baseline								
Neuroticism[a]	0.07	–	–	−0.03	0.14	–	–	0.00
Mastery[a]	–	−0.11	–	0.08	–	−0.39[e]	–	−0.38[e]
Self-efficacy expectancies[a]	–	–	−0.29[e]	−0.35[e]	–	–	−0.14	−0.03
Age	0.26[e]	0.24[e]	0.26[e]	0.28[e]	0.47[e]	0.39[e]	0.40[e]	0.38[e]
Gender[b]	0.06	0.05	0.04	0.04	0.03	0.08	0.01	0.07
Chronic medical conditions[c]	0.06	0.06	0.10	0.11	0.23[e]	0.20[e]	0.22[e]	0.20
Functional disability[d]	−0.21[e]	−0.23[e]	−0.26[e]	−0.25[e]	−0.34[e]	−0.52[e]	−0.35[e]	−0.52[e]
At follow-up								
Severity of disease[d]	0.19	0.20[e]	0.14	0.14	0.04	0.03	0.06	0.03
Overall R^2 (%)	11	11	18	18	32	41	31	42
Overall F	2.4[e]	2.5[e]	4.3[e]	3.3[e]	5.1[e]	7.9[e]	5.1[e]	5.8[e]
dfs	6, 119	6, 119	6, 119	8, 117	6, 67	6, 67	6, 67	8, 65

Note. Regression 1 included neuroticism but not mastery and self-efficacy expectancies as predictor. Regression 2 included mastery but not neuroticism and self-efficacy expectancies as predictor. Regression 3 included self-efficacy expectancies but not neuroticism and mastery as predictor. Regression 4 included neuroticism, mastery and self-efficacy expectancies. Standardized regression coefficients are reported.

[a] Higher scores indicate higher levels of neuroticism, mastery, and self-efficacy expectancies.

[b] 1 = male, 2 = female.

[c] Number of chronic medical conditions.

[d] Higher scores indicate poorer function.

[e] $p < 0.05$.

AMI-patients. The results show that pre-morbid levels of self-efficacy expectancies influenced functional decline in CHF-patients, while pre-morbid levels of mastery contributed significantly to functional decline in AMI-patients. Adjustments were made for age, gender, severity of disease and baseline number of chronic medical conditions and level of functional disability. Age was an independent predictor of functional decline in both CHF and AMI patients. The number of chronic medical conditions at baseline was an independent predictor of functional decline in AMI-patients, although the significance of the regression coefficient in the full model of step 4 was borderline ($\beta = 0.20$, $p = 0.058$). The highest variance inflation factor in all regression models was 1.87 and therefore much lower than 10.0 which can be considered acceptable [40].

Discussion

In this article, we reported on the influence of three psychological attributes i.e., neuroticism, mastery and self-efficacy expectancies) on functional decline after a cardiac event (i.e. CHF and AMI). We found unique contributions of pre-morbid levels of self-efficacy expectancies to functional decline in CHF-patients and of mastery to functional decline in AMI-patients, while adjusting for age, gender, severity of the disease and number of chronic medical conditions and functional disability at

baseline. CHF-patients with higher pre-morbid levels of self-efficacy expectancies and AMI-patients with higher pre-morbid levels of mastery showed lower functional decline after onset of their disease compared to patients with lower levels of either self-efficacy expectancies or mastery. Although neuroticism was not related to functional decline, we may conclude that psychological attributes affect functional decline after the onset of cardiac disease.

The results of the study give some evidence for a differential effect of the selected psychological attributes on functional decline for the two types of cardiac patients: the multiple regressions showed that self-efficacy expectancies are particularly relevant against functional decline after CHF, while levels of mastery particularly contribute to functional adaptation after AMI. This may be associated with the specific characteristics of both patient samples. CHF-patients were older, and their pre-morbid (baseline) levels of functional disability and chronic medical conditions as well as their functional decline after the event (although not significant) were worse than the AMI-patients. Compared to CHF, the incidence of AMI may tend to be experienced 'as a bolt out of the blue' in which feelings of controllability (e.g. mastery) of (future) life-changes seem to be vital for daily functioning. By contrast, CHF generally develops more gradually. Mendes de Leon et al. [32] suggested that high levels of self-efficacy expectancies may protect against functional decline after acute events as well as gradually increasing functional decline. Although we found no significant differences between CHF and AMI with respect to the bivariate correlations between the psychological attributes and functional decline, the results of our study suggest some differential effect of self-efficacy expectancies in CHF-patients and of mastery in AMI-patients.

The impact of both CHF and AMI on functional disability was substantial which is consistent with previous research. Functional disability significantly increased after the emergence of either CHF or AMI. Previous research suggested that psychological attributes may help patients to regain or maintain relatively high levels of functional ability despite their medical problems (see Introduction). Our results support these suggestions.

Our prospective study included patients with a new episode of CHF and AMI after the baseline assessment in 1993. The strength of this approach is that we assessed the psychological attributes and the selected covariates at baseline before a new episode of CHF or AMI emerged. However, this approach also has several limitations. The time interval between the start of the study and the onset varied from immediately after baseline to 44 months later (mean: 21 months, SD: 12 months). Health status may have changed during the interval. However, the correlation coefficient between the length of the time interval and functional decline between baseline and follow-up in the total patient sample was 0.09 ($p = 0.192$). We may assume therefore that the variation in the interval did not affect the outcome of the study. As mentioned before, attrition occurred due to mortality, participation in one of the other GLAS cohort studies, very poor physical and/or mental health and refusal to participate. However, we found almost no baseline differences on the selected variables except age among the AMI-patients between participating patients and those who did not participate at follow-up. In addition, our study was focused on the associations between psychological attributes and functional decline after cardiac disease and not on a representative description of either functional decline or psychological functioning of cardiac patients. We assume that the influence of attrition on the outcomes is probably not very strong. Furthermore, 30% of the included AMI patients and 41% of the included CHF patients already reported heart problems during the baseline interview; unfortunately we do not have any physician-registered baseline morbidity for our patients. We included in our study all patients for whom a new episode of either CHF or AMI was recorded after baseline according to the criteria of the International Classification of Primary Care (ICPC). In addition, only one single assessment 8 weeks after diagnosis was included in the present study. Because more changes in functional ability may be expected with time, a longer follow-up period may be appropriate. Next, for practical reasons disease severity was not assessed at the time of diagnosis but at follow-up (severity may have changed in the meantime). And finally, although we considered the selected psychological attributes as being fairly

stable over time (particularly in a period of a couple of years), they may have been influenced by either CHF or AMI.

We conclude that psychological factors such as mastery and self-efficacy expectancies affect functional decline after CHF or AMI. As suggested by Sullivan et al. [10], psychological attributes can be considered important additional explaining factors for functional disability after cardiac disease. Clinicians may benefit from the knowledge that psychological attributes affect functional outcomes, irrespective of the severity of the disease. In addition, the three selected psychological attributes were significantly related to disease severity in CHF-patients. Both functional status and psychological functioning need to be incorporated in rehabilitation and clinical management of cardiac disease. Future research should include intervention trials on altering psychological factors in patients who suffer or recover from cardiac disease.

Acknowledgements

This research is part of the Groningen Longitudinal Aging Study (GLAS). GLAS is conducted by the Northern Centre for Healthcare Research (NCH) and various Departments of the University of Groningen in The Netherlands. The primary departments involved are Health Sciences, Family Medicine, Psychiatry, Sociology (ICS) and Human Movement Sciences. GLAS and its substudies are financially supported by the Dutch government (through NESTOR), the University of Groningen, the Faculty of Medical Sciences, the Dutch Cancer Foundation (NKB/KWF), and the Netherlands Organization for Scientific Research (NWO). Preparation of this paper was supported by a grant from NWO, grant 905-59-104. The central office of GLAS is located at the NCH, A. Deusinglaan 1, 9713 AV Groningen, The Netherlands.

Appendix

Description of measures: items, response options and theoretical range

Groningen activity restriction scale (18 items). Can you, fully independently, dress yourself … get in and out of bed … stand up from sitting in a chair … wash your face and hands … wash and dry your whole body … get on and off the toilet … feed yourself … get around in the house (if necessary with a cane) … go up and down the stairs … walk outdoors (if necessary with a cane) … take care of your feet and toenails … prepare breakfast or lunch … prepare dinner … do 'light' household activities (for example dusting and tidying up) … do 'heavy' household activities (for example mopping, cleaning the windows and vacuuming) … wash and iron your clothes … make the beds … do the shopping? Answer options: 1. Yes, I can do it fully independently without any difficulty; 2. Yes I can do it fully independently but with some difficulty; 3. I can do it fully independently but with great difficulty; 4. No, I cannot do it independently, I can only do it with someone's help. Theoretical range 18–72; higher scores indicate poorer functioning.

Neuroticism (12 items). Does your mood often go up and down? Do you ever feel 'just miserable' for no reason? Are you an irritable person? Are your feelings easily hurt? Do you often feel 'fed-up'? Would you call yourself a nervous person? Are you a worrier? Would you call yourself tense or 'highly strung'? Do you worry too long after an embarrassing experience? Do you suffer from 'nerves'? Do you often feel lonely? Are you often troubled about feelings of guilt? Answer options: Yes and No. Theoretical range 0–12; higher scores indicate higher levels of neuroticism.

Mastery (7 items). I have little control over the things that happen to me. There is really no way I can solve some of the problems I have. There is little I can do to change many of the important things in my life. I often feel helpness in dealing with the problems of life. Sometimes I feel that I'm being pushed around in life. What happens to me in the future mostly depends on me. I can do just about anything I really set my mind to. Answer options: 1. Completely agree; 2. Mostly agree; 3. Neither agree/nor disagree; 4. Mostly disagree; 5. Completely disagree. Theoretical range 7–35; higher scores indicate higher levels of mastery.

Self-efficacy expectancies (16 items). When I make plans, I am certain I can make them work. One of my problems is that I cannot get down to work when I should. If I can't do a job the first time, I keep trying until I can. I am a self-reliant person. When I set important goals for myself, I rarely achieve them. I avoid facing difficulties. If something looks too complicated, I will not even bother to try it. When I have something unpleasant to do, I stick to it until I finish it. I do not seem capable of dealing with most problems that come up in life. When I decide to do something, I go right to work on it. When trying to learn something new, I soon give up if I am not initially successful. When unexpected problems occur, I don't handle them well. Failure just makes me try harder. I avoid trying to learn new things when they look too difficult for me. I feel insecure about my ability to do things. I give up easily. Answer options: 1. Disagree; 2. Disagree somewhat; 3. Neither agree/nor disagree; 4. Agree somewhat; 5. Agree. Theoretical range 16–80; higher scores indicate higher levels of self-efficacy expectancies.

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